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INTRODUCTION.

THE following Engravings are submitted to the public, with the view of throwing light upon the Anatomy of the contents of the Thorax and Abdomen, and of the passages for the air and food into the hollow bowels included within these cavities, by giving a representation of these parts, as they appear in a subject in the full vigour of health, and immediately after a violent death, which occasioned little injury to the organic structure. The subject from which the engravings were taken had the additional recommendation of exhibiting what may be called the ordinary structure of the parts, and consequently of forming a more exact type of general nature than commonly occurs in practice.

The discovery of the art of Printing, justly ranked amongst the greatest proofs of human ingenuity, has had a great effect in preserving and diffusing knowledge. In the science of Anatomy, it has been lamented, that the knowledge communicated by verbal description of figure is im-

perfect, being inadequate to convey to the mind a just representation of the object. to bring it immediately before the eye of the reader, and to give it that colour of reality, which would enable him, did he possess a knowledge of drawing, to delineate it. The mathematician requires the aid of diagrams ; the geographer, of globes and maps ; and the anatomist is obliged to resort to figures of the bones, muscles, bowels, arteries.

Beside those causes of obscurity, which are inseparable from every verbal description, there are some which are peculiar to the science of Anatomy. The language of the anatomist is still in an unphilosophical and imperfect state. having only partially received that new modelling and improvement, which has given stability, force, and precision, to the Chemical Nomenclature of the present day.

Different names are also applied to the same part by different writers on the subject, and much confusion and perplexity arise from the uncertain reference of the general terms of the art. These imperfections in the verbal description may be obviated to a considerable extent by the aid of the engraver, whose figures, if true to nature, communicate to every eye distinct ideas of form, magnitude, situation, connection, texture, and colour.

In tracing the progress of improvement in the science of Anatomy, we incidentally learn from the precious remains of the works of the great Artists of the 15th century, that the practice of exact anatomical drawings was carried at that period almost to perfection. Whether we are indebted for the introduction of this great improvement, for the purpose of promoting their art, to LEONARDO DA VINCI, or to MICHAEL

ANGELO BUONAROTTI, seems uncertain. Both were no less distinguished as anatomists than as painters; both practised dissections; and both have left many anatomical drawings. According to **VASARI**, **LEONARDO** had applied to the study of anatomy with great diligence, under **MARC ANTONIO DELLA TORRE**, Professor of Anatomy at Pavia, and practised dissections, from which he made many drawings, subjoining the necessary verbal explanations. These drawings, after his death, were collected by his pupil **MELZI**, and now form a part of the collection of drawings of our Sovereign. Of these drawings, *fac similes*, engraved by the celebrated **BARTOLOZZI**, have been published, under the direction of the King's Librarian, **Mr. CHAMBERLAINE**, who has added a short history of the life of **LEONARDO**, and also a version of the explanations and observations upon the drawings. It is not undeserving notice, that the drawings above alluded to, are not merely copies of those muscles which lie under the skin, and of those parts of the body which are useful to the painter in his own profession, but of almost of every part of the body; and every true lover of anatomy must join **Mr. Roscoe***, in regretting, "that
 " the same mode of execution (alluding to etching) was not occasionally
 " resorted to by the other great artists of the time, and that we are not
 " allowed to contemplate the bold contours of **MICHAEL AGNOLO**, or the
 " graceful compositions of **RAFFAELLO**, as expressed and authenticated by
 " their own hand."

The value of the anatomical drawings of **LEONARDO DA VINCI**, has received a just tribute of applause from the ardent mind of **Dr. WILLIAM**

* Vid. Vol. IV. 1st edit. p. 265, of his elegant History of the Life and Pontificate of Leo the Tenth.

HUNTER *; but that zealous inquirer into the history of his science does not appear to have known, that MICHAEL ANGELO BUONAROTTI, who flourished about the same period, was no less the rival of LEONARDO in anatomy than in painting. He also was a zealous anatomist, and notwithstanding the prejudices of the times, and though suffering from a disordered stomach, which he imputed to his dissecting, he persevered in anatomy, and intended, as his pupil and biographer CONDIVI informs us, to publish a complete book upon Anatomy, and upon the proportions of the human body; but, most unfortunately for mankind, he, who was so well qualified for such an undertaking, did not fulfil his intention.

We have not been informed by his biographers, VASARI and CONDIVI, what had become of the manuscript of MICHAEL ANGELO's book. Happily, however, the drawings have been preserved, and some of these have fallen into my hands, through the good offices of WILLIAM YOUNG OTTLEY, Esq. who procured them while he was in Italy during the Revolution 1798. From the above Gentleman I lately received the drawings, with a letter of which I subjoin a short extract :

“ Amongst my drawings of MICHAEL ANGELO BUONAROTTI, I have
“ two Anatomical Studies, which I have always considered of great me-
“ rit and interest. One of these, which is $17\frac{1}{4}$ inches high, exhibits a
“ very careful, and I think most admirable figure in a front view, the
“ right arm elevated, and kneeling on the left knee; it is drawn in
“ pen, and shaded with bistre. The other, of nearly the same dimen-

* Vid. his Introductory Lecture.

“sions, is drawn in black chalk with great boldness, and, I need scarcely
“add, intelligence.”

Besides the above drawings, I have also six smaller Studies, which I obtained through the same channel. The fidelity, detail, correctness, and precision, in marking the forms of the muscles, bones, and joints, are truly admirable. There is more labour, more finish, on one of the arms, than in the whole figure of other artists. His mode of procedure is highly interesting; he first drew the bones, and then the muscles which cover them, on the same sheet of paper*.

Upon comparing the above drawings of MICHAEL ANGELO BUONAROTTI with those of LEONARDO, I have no hesitation in pronouncing them decidedly superior, and I trust, that the public may also be disposed to agree with me, when the engravings from MICHAEL ANGELO's drawings are published.

In short, MICHAEL ANGELO BUONAROTTI is no less distinguished as an Anatomist, than as an Architect, Sculptor, and Painter, who, to make use of the emphatic language of VASARI, “carries the palm from the
“living and the dead.”

After all, it must also be acknowledged, that Figures have their imperfections; for by words only can the several uses, chemical composition, &c. of our different organs be explained. In short, the arts of Printing and Engraving, being separately imperfect, always ought to

* While writing these lines, the sketch for one of the arms of his celebrated Statue of Moses lies before me, which is drawn according to the above plan.

go hand in hand, as, by their combined aid, knowledge may be clearly and readily communicated, the ideas of the author being, as it were, repeated by the aid of graphical illustration, become, like the undulations of sound, stronger by repetition, and sometimes indelible.

Deeply impressed with the importance of graphical illustration, as a means of facilitating the study of Anatomy, I subjoined to my Outlines of the Anatomy of the Human Body, in its sound and diseased state, (which were lately published,) many engravings, most of which represent the effect of organic derangements; and this I did from a persuasion, that the public were already in possession of a greater number of engravings representing the healthy than the diseased structure.

Since the publication of my Outlines of Anatomy, it has been hinted to me, by several friends, that faithful representations of the bowels of the chest and belly, taken immediately after death, had not yet been published.

It were superfluous, and indeed misplaced, to enter into a long digression, in order to convince the reader of the great importance of the study of the anatomy of the bowels of the chest and belly. I shall therefore content myself by remarking, that upon the healthy action of these bowels, perhaps the most important functions of the animal œconomy depend; that these bowels are subject to a great many derangements as to their functions and structure, some of which may be relieved or removed by art; and that the seats, effects, and probable consequences of such organic diseases, can be obtained only by an accurate knowledge of the situation and connection of these bowels in their healthy condition.

* After quoting a passage from Hippocrates.

“ Attamen,” says that acute observer and celebrated practical physician SYDENHAM, (“ ne vel divinus hic auctor *, erroris ullatenus insimulatur, vel ex hoc loco empirici ignorantiae suae patrocinium quaerant) “ aperte dicam, me, quantum attentissima cogitatione, eaque ad praxin “ relata, adsequi valeam; utcunque existimare, quod necesse omnino sit, “ ut medicus structuram humani corporis probe calleat ; quo rectius veras “ ideas, et naturae et causarum quorundam morborum, animo concipere “ ac formare queat*.

It may not be improper here to add, that it is impossible to give a correct view of the bowels of the abdomen from a body that is cold ; for if the body be cold, the air included within the intestinal canal is condensed, the intestines do not retain their original situation and tint, as the bile, blood, and other fluids, exude, by which the natural colour of the bowels is lost.

In these circumstances, I resolved, on the first favourable occurrence, to endeavour to supply what is wanted, and have been fortunate in procuring not only the assistance of three excellent artists, Messrs. LIZARS, SYME, and GIBSON, but also very good originals for my purpose. The bodies of two criminals were brought to the Anatomical Theatre immediately after execution. The cavity of the abdomen of one of these was immediately exposed, and before the body was cold ; the artist, Mr. LIZARS, who had his canvas and pallet ready, immediately began his painting, in which he was extremely successful. My friend

* Vid. Treatise De Hydrope.

DR. RUTHERFORD, and several other competent judges, compared the painting with nature, pronounced it to be a very faithful portrait of the original, and urged me strongly to put it into the hands of the Engraver.

Having mentioned the motives which have induced me to publish the annexed Engravings, it may not be unsuitable to add a few remarks upon the manner in which they were constructed, and in what respects they differ from those which have already been published.

Anatomical Engravings are either portraits of individual nature, by which the object is represented as it was seen by the artist, or they are plans, or representations, such as have been conceived by the imagination of the Anatomist.

I have preferred the former of these, as being more true, more natural, and at the same time more elegant ; for it is impossible to combine truth and elegance in a plan, which, like a geometrical diagram, is more an ideal than a real representation.

Considerable attention was paid not only to the selection of the subject from which the engravings were copied, but also to a circumstance of no small importance, that of placing it in a proper point of view.

The attitude should be easy, and such as is usually presented to the eye of the student ; it ought not to be constrained or uncommon, nor such as requires the aid of much perspective, the effect of which many students do not understand, and hence, receive a false or indistinct idea of the form, size, or position of the several parts of the figure. In short, Anatomical Engravings should, as far as possible, be rather ORTHOGRAPHIC PROJECTIONS than representations in perspective, these being intelligible to every class of students.

ALBINUS, in his Preface to his celebrated edition of the engravings of EUSTACHIUS *, has made upon this point several very pertinent observations, which are too important to be omitted. “*Satis habens, observationes*
 “*anatomicas veras et certas simpliciter exprimere, plus artis, quam ad id satis*
 “*perspicuae exequendum requirebatur, non adhibuit, cum VESALIO cum poste-*
 “*rioribus, non de artis, quibus observationes anatomicae exprimantur, palma*
 “*contendens, sed ipsis certans observationibus. Et certe si alterutro est in figu-*
 “*ris anatomicis carendum, hoc est, aut veritate et perspicuitate rerum, quae ex-*
 “*hibeantur, aut arte qua exhibeantur, carendum potius arte, quippe cum figuras*
 “*praesertim propter res, quas exprimant, expetamus, non propter artem, qua*
 “*exprimantur. Quocirca multo hercle laudabiliore sunt EUSTACHII hae figu-*
 “*rae, in quibus res exquisitae, ars nulla, quam aliorum, quae arte quidem supe-*
 “*riores sunt, inferiores autem rebus illis quae ad anatomen spectant.*”

Anxiously attentive to the above circumstances, much care was devoted to the placing the body in such a situation, as to retain the moveable bowels in their natural position, and at the same time to preserve so much of the neighbouring or containing parts, as to give a correct representation of the relative position of one part to another. In Plates I. and IV. views of those parts different from any with which the Author is acquainted are given, much care having been taken to communicate a faithful idea of the relation of one part to another.

It is much to be regretted, that the greater number of anatomical engravings are of too small a size, and not executed according to an exact scale.

* Page 13.

SCARPA, MASCAGNI, CALDANI, HUNTER, and SOEMMERRING, unite with me in opinion respecting the size of engravings, and have sanctioned it by their practice. SOEMMERRING, in noticing my father's book on the *Bursæ Mucosæ*, thus strongly expresses himself: "Omnium optimum opus, Icones descriptarum bursarum magnitudine naturali, ut uno quasi intuitu earum positus, figura, magnitudo comprehendi possint quod sola descriptione nunquam effici potest."

In a small engraving, the smaller parts of the subject must, *if reduced by an accurate scale*, be rendered indistinct, and if rendered in such small engravings obvious, *they do not bear the proportion of nature to the other parts*. Hence, the original drawing should be reduced by an exact scale, which should be mentioned, that the reader may judge accurately of the size and proportions of the several parts in Nature.

For the reasons above stated, the parts in Plate I. are represented of the size of Nature, but in the other engravings, the parts being large in Nature, are represented upon a reduced scale, being only of one half of the size of the original.

Two of the annexed Plates have been faithfully coloured from the original paintings, in order that they might be more accurate representations of Nature. By adopting such a plan, some of those errors which have crept into the works of anatomists, respecting the colour of the viscera, may be removed. The liver, for instance, has been stated to be of the colour of mahogany, a simile which is by no means good, as different kinds of mahogany are of very different shades of colour, whereas the liver of a person recently dead is of a pink colour, and acquires its resemblance to mahogany from time and exposure to the air. Colour

merits peculiar attention, as it is in some instances the only criterion by which a sound part may be distinguished from a diseased.

The mode of engraving which has been adopted by ALBINUS, WALTHER, SCARPA, HUNTER, SOEMMERING, CALDANI, and others, though extremely beautiful, is objectionable ; it requires much time and labour, and hence, is very expensive, so that the engravings done in that manner are beyond the reach of the student, and accessible only to the rich.

With the view of obviating so material an objection, a different mode of engraving, which necessity suggested to me a few years ago, has been adopted in the following Plates.

To my Thesis *De Dysphagia*, several engravings are affixed ; and the laws of the University required, that the Inaugural Dissertations shall be published on a certain day.

There was not sufficient time to finish all the Engravings in the stroke manner, as it has been called, therefore I was under the necessity of requesting of Mr. FIFE to engrave one of the Plates in *aquatinta*, which he politely did ; but upon taking a proof, the engraving was found to be deficient in force and effect ; to obviate which imperfection, I put upon the *aquatinta* ground, a great many dots with a sharp pointed instrument, which was found, upon taking a second impression, to have removed the objection.

About two years ago, I shewed the result of my experiment to Mr. MITCHELL, the author of the subjoined Plates, who, by repeating the process, has much improved it, and has rendered this mode of engraving so perfect, as to be able by it to give great force, and at the same time a high degree of finish, which is of much moment in an Ana-

tomical Engraving, where the subject is new, or imperfectly understood by the reader.

The above mode of engraving possesses another advantage over that done in lines; it is much better adapted for receiving different colours, by which a more exact portrait of Nature is given.

Before concluding, it cannot be superfluous to add, that though engravings faithfully executed may prove useful to the student, by recalling to his mind what he may have seen at lectures, and may also assist him in following the descriptions of an anatomical author, yet they are by no means calculated to supersede the necessity of dissection, which is the only avenue to a correct knowledge of Anatomy.





P. Syme Del.

Published by The J. B. Rye & Co. Edin' 1814

F. Mitchell Junr.

EXPLANATION

OF

PLATE I.

THIS Engraving was copied from a vertical section of the Cranium, Nose, and Cervical Vertebrae; one half of the Under Jaw Bone has been removed, to expose the Tongue and other parts of the Mouth, together with the Pharynx and passages communicating with it.

1. Points out a section of a part of the Os Frontis.
2. and 3. A part of the Brain Case.
4. The CRISTA GALLI of the Æthmoid Bone, rising upwards from the Cribriform plate of that bone. This part of the Æthmoid Bone sometimes inclines more to one side than the other.
5. The SPHENOIDAL SINUS; a few of the ETHMOIDAL CELLS are also seen.
6. The SEPTUM NARIUM, composed of the descending plate of the Æthmoid Bone, the Vomer, and Cartilage; all of which parts are lined by a very vascular mucous membrane, commonly called SCHNEIDER'S membrane.
7. The Os TURBINATUM SUPERIOR, a rough bony plate, with a projecting convex surface, placed parallel to the Septum Narium, and covered by a mucous membrane.

8. The *Os TURBINATUM INFERIUS*, which is like the *Os Turbinatum Superius* in form, and varies somewhat as to shape and size in different individuals, and still more in quadrupeds.

9. The *CARTILAGINOUS POINT* of the Nose.

10. and 11. The *PALATINE PROCESS OF THE SUPERIOR MAXILLARY BONE* AND *PROPER PALATE BONES*, with the membranes connected with them, which form the partition between the Nose and Mouth.

A little below number 12. the Posterior Nares and Mouth communicate with each other.

13. The widest part of the *EUSTACHIAN TUBE*, or passage of communication between the Nose and Mouth, which being encircled by cartilage, therefore is always open.

14. The *UNDER JAW* divided at its symphysis.

15. Portions of the *UPPER* and *UNDER Lips*.

16. The *TONGUE*, covered by its membrane, and differently shaped papillæ, drawn out slightly. As the Tongue is connected by a ligament to the Epiglottis, the drawing forwards the Tongue has the effect of raising the Epiglottis, and opening the passage into the Larynx.

17. Points out the Moveable Musculo-Membranous Arch, called *VELUM PALATI*, which is suspended over the basis of the Tongue, and forms the posterior boundary of the Mouth. When the *VELUM PALATI* is drawn upwards by its Levator muscles, the food cannot pass into the Nostrils. The lateral edges of the *Velum Palati* are subdivided into two musculo-membranous folds, the anterior of which is fixed to the base of the Tongue, within the membrane of which, the muscle called *Glosso-Palatinus*, or *Constrictor isthmii Faucium*, is placed. By the contraction of these muscular fibres, the *Velum Pendulum Palati* is drawn downwards during deglutition, by which the passage into the Nose is shut.

The Posterior edge of the *VELUM* is fixed to the side of the Pharynx.

18. The conical shaped body, called *UVULA*, depending from the middle of the palate, which is extremely irritable, and when touched,

throws all the neighbouring organs into a sympathetic action. Within the membrane, proper to the Uvula, there are a few Muscular Fibres, which have been described under the name of **PALATO-UVULARIS MUSCLE**. These muscular fibres arise from the palate bones, and terminate in the point of the Uvula, and tend to draw the Uvula upwards.

19. and 20. Point out the Musculo-Membranous Sac, called **PHARYNX**, which is situated behind and under the tongue, and connected with the Sphenoid and Occipital Bones, and bounded by the Pterygoid processes of the Sphenoid Bone, the Cornua of the Os Hyoides, the Carotid Arteries, and Jugular Veins.

The **PHARYNX**, which is represented after being opened, is subservient to the double office of giving passage to the air into the lungs by the medium of the Larynx and Trachea, marked 21, and also to the bolus of food into the Gullet, marked 22. The Gullet, placed behind the Windpipe, in its collapsed state is nearly flat.

The bolus of food passes through the Gullet by a well directed muscular effort, and not on account of its weight.

23. and 24. Point out the back part of the **PHARYNX** connected with the **Vertebræ of the Neck**.

25. The **LARYNX**, which extends between the Os Hyoides and Trachea.

The **EPIGLOTTIS**, a ligamento-cartilaginous substance, in shape somewhat like the tongue, is seen raised, the Tongue being a little drawn forwards. This elastic lid, which when depressed shuts the passage into the Glottis, is covered by a fine mucous membrane, the surface of which is kept moist by a quantity of mucus.

As the Larynx constitutes the fore part of the Pharynx, when the Pharynx is elevated and dilated, the Larynx, as **CASSERIUS** has justly observed, is also raised, by which the passage into the glottis is shut.

26. and 27. Point out the **CAROTIS COMMUNIS ARTERY**, running upwards towards the head at the side of the Pharynx.

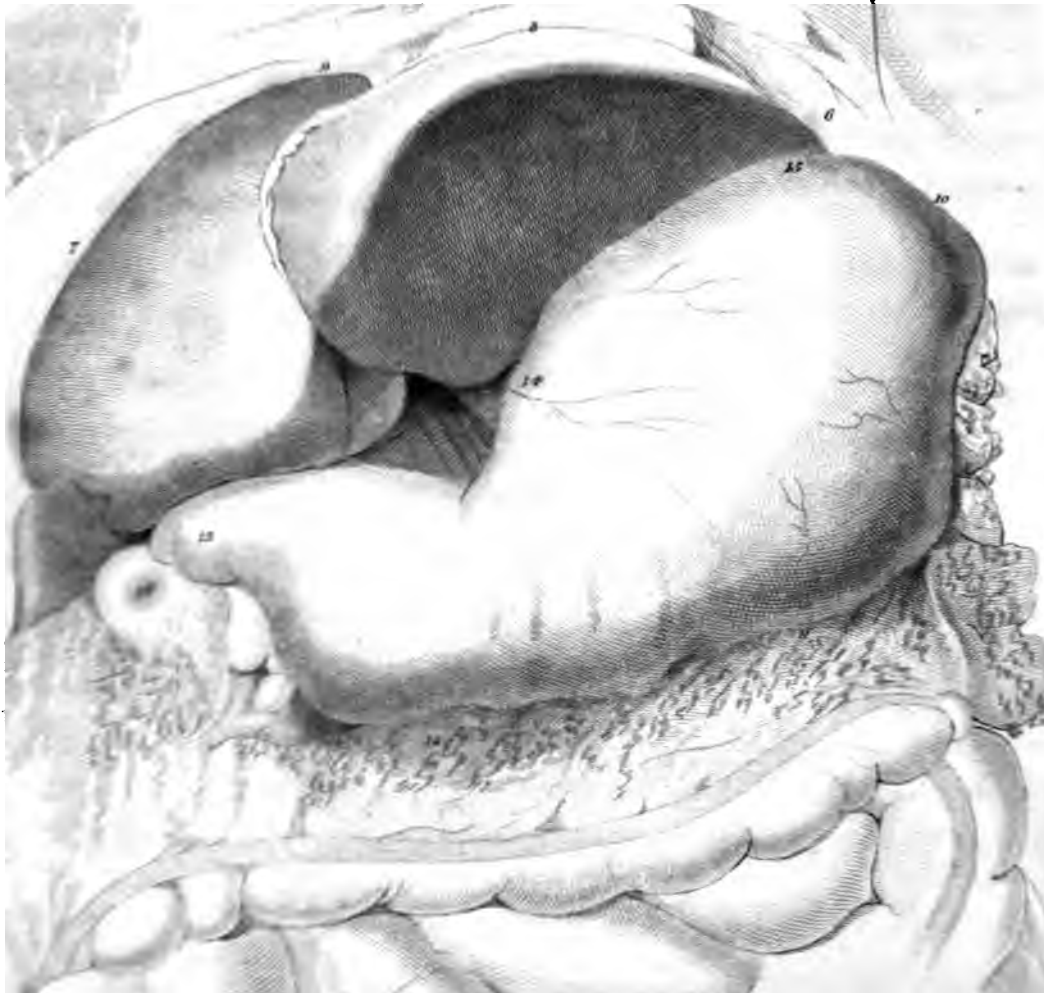
28. 29. and 30. Point out the **CANAL FOR THE SPINAL MARROW**; and 30. 31. and 32. sections of the **CERVICAL VERTEBRÆ**.

Upon the functions of the several organs, DR. PALEY * has published the following very important and excellent observations :—

“ There are brought together within the cavity of the mouth more
“ distinct uses, and parts executing more distinct offices, than I think
“ can be found lying so near to one another, or within the same com-
“ pass, in any other portion of the body ; viz. teeth of different shape,
“ first, for cutting, secondly, for grinding ; muscles, most artificially dis-
“ posed for carrying on the compound motion of the lower jaw, half
“ lateral and half vertical, by which the mill is worked ; fountains of
“ saliva, springing up in different parts of the cavity for the moistening
“ of the food, whilst the mastication is going on ; glands, to feed the
“ fountains ; a muscular constriction of a very peculiar kind in the back
“ part of the cavity, for the guiding of the prepared aliment into its
“ passage towards the stomach, and in many cases for carrying it along
“ that passage ; for, although we may imagine this to be done simply by
“ the weight of the food itself, it in truth is not so, even in the upright
“ posture of the human neck ; and most evidently is not the case with
“ quadrupeds, with a horse for instance, in which, when pasturing, the
“ food is thrust upwards by muscular strength, instead of descending of
“ its own accord. In the mean time, and within the same cavity, is
“ going on another business, altogether different from what is here de-
“ scribed,—that of respiration and speech. In addition therefore to all
“ that has been mentioned, we have a passage opened from this cavity
“ to the lungs, for the admission of air, exclusively of every other sub-
“ stance ; we have muscles, some in the larynx, and without number in
“ the tongue, for the purpose of modulating that air in its passage, with
“ a variety, a compass, and precision, of which no other musical instru-
“ ment is capable. And, lastly, which, in my opinion, crowns the whole
“ as a piece of machinery, we have a specific contrivance for dividing
“ the pneumatic part from the mechanical, and of preventing one set of
“ actions interfering with the other.”

* Vid. Nat. Theology, pag. 146.

PLATE II.



EXPLANATION

OF

PLATE II.

IN this Engraving the **STOMACH** and **LIVER** of an **ADULT** are represented, and also a **Portion** of the **DUODENUM**, and nearly of one half of the size of Nature.

The **HEAD** and **NECK** are represented in a fore-shortened view.

Fig. 1. and 2. Are placed upon the outlines of the **SHOULDERS** and **ARMS**; and **3. and 4.** upon the **PARIETES** of the **ABDOMEN**.

7. 8. and 9. Point the **LOBES** of the **LIVER**; both the larger Lobes were somewhat raised, to expose the **STOMACH** more fully to view.

The **Stomach** is represented as it appears when moderately distended; for when it is much stretched, its **Muscular Fibres** are elongated, from being overstretched.

The conical form and oblique position of the **STOMACH** are faithfully represented, and also the **Smaller** and **Larger Curvatures** of the **Stomach**.

Neither of the orifices of the **Stomach** are seen in this view.

Figures 10. 11. and 12. Are affixed to the **Larger Curvature** of the **STOMACH**; and **figures 14. 15. and 16.** upon the **Smaller**.

When the **Stomach** has been distended to a greater degree, the greater arch of the **Stomach**, marked by **figures 11. and 12.** be-

comes still more prominent, and the Stomach is so enlarged, as to occupy the whole or the greater part of the space between the Cartilages of the False Ribs of opposite sides of the Chest. When the Stomach is empty, the villous coats of the opposite surfaces of the Stomach are brought into contact; and the coats are separated by the food which has been swallowed; but the muscular action of this organ is not excited, until the Stomach be distended to a certain degree.

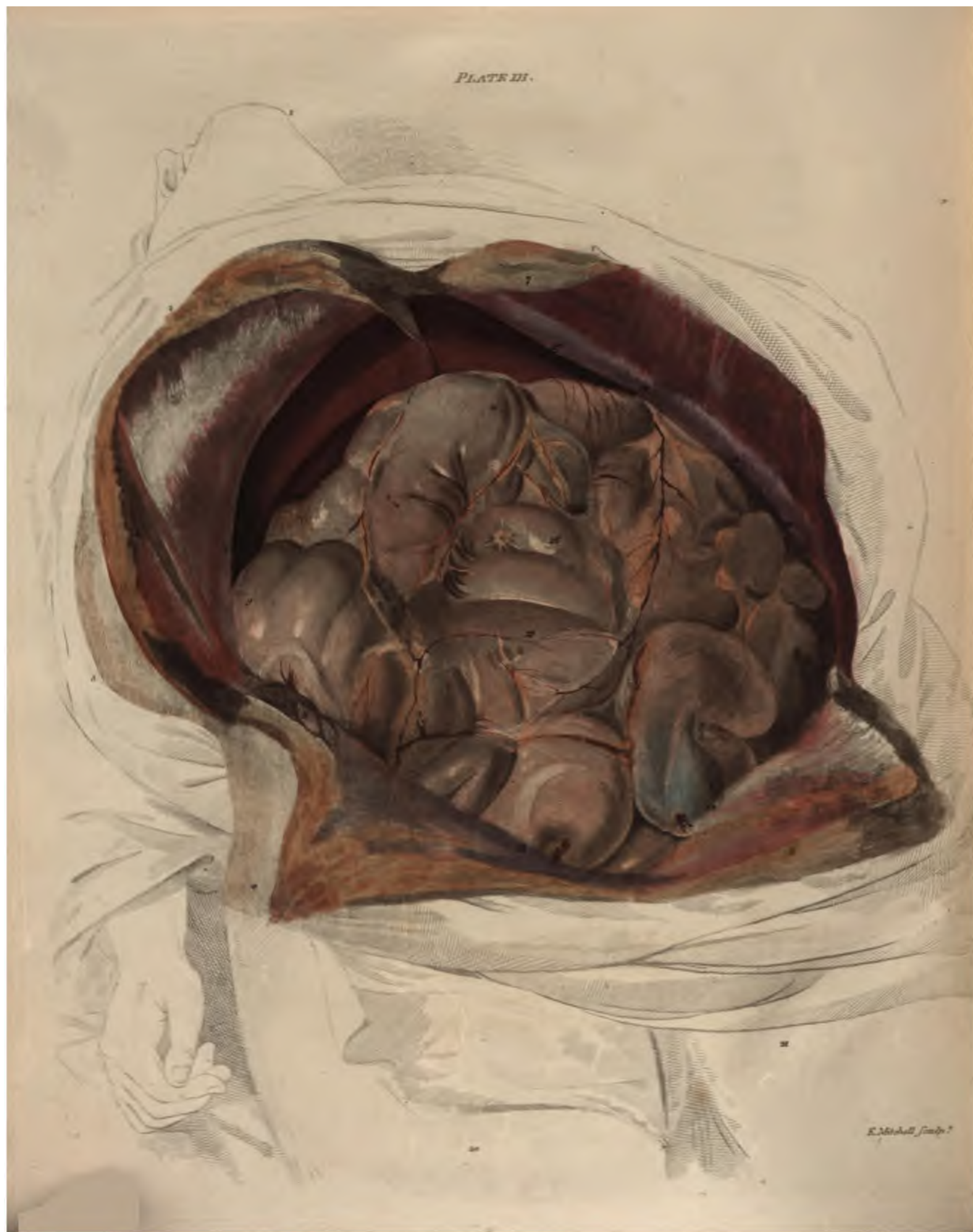
The lower orifice of the Stomach called *Pylorus*, (as the name expresses,) may be regarded as a vigilant sentinel, and from its possessing great sensibility, and also a considerable contractile power, to which may be added the change of position when the Stomach is filled, the contents of this organ are prevented from escaping, until they have been converted into a homogenous grayish coloured substance, called *Chyme*, and the digestion, in so far as it depends upon the Stomach, has been completed, and whenever that has taken place, the Muscular Fibres of the Pylorus are relaxed, and the contents of the Stomach pass readily into the Duodenum.

The changes which the food undergoes within the Stomach have been imputed to *Fermentation*, to *Trituration*, and to *Putrefaction*.

But digestion within the Stomach is a process *sui generis*, and very different from fermentation; for the solution begins at the surface, and advances towards the centre; it is not the effect of trituration, for it goes on within the Stomach in a metalline hollow sphere perforated with holes; it is very different from putrefaction, as the digesting fluid checks putrefaction, and even renders putrid animal substances sweet; it is accomplished by the Gastric Juice, which is not a diluent, but a solvent, and produces out of the body the same effects, as upon the contents of a hollow perforated silver sphere which has passed through the Alimentary Canal.

Fig. 16. Points out that Portion of the DUODENUM which is connected with the PYLORUS.





EXPLANATION

OF

PLATE III.

THIS Engraving has been coloured after the original painting by Mr. LIZARS, in order that it might be a more faithful portrait of Nature, and might communicate to the reader an idea of the colour of the Bowels in a healthy state, as they appear upon being exposed a short time after death, when the body is still warm; for, in consequence of the condensation of the air included within the Intestines, they change their place, and therefore have not been by many authors represented in their proper situation.

In the subject from which the Engraving was taken, the Intestines were not distended in an irregular manner, as often happens in persons who have suffered a violent death: I have seen the Colon of a man, who had been killed by hanging, so much contracted, as not to be larger than that of an infant at birth; whilst a part of the Ileum of the same subject was extended to four times its natural size.

1. Is placed upon the HEAD, which was much thrown back.
2. 3. 4. 5. 6. and 7. Point out the PARIETES of the ABDOMEN.
8. Shews the CAPUT CAECUM COLI; 9. the ascending Portion of the COLON; 10. a part of the Transverse Arch of the COLON; and 11.

and 12. the Colon of the left Side, which terminates in the Sigmoid Flexure of the Colon, marked by figures 13. and 14.

15. and 16. Point out the turns of the Smaller INTESTINES.

In the lower classes of Animals, the Alimentary Canal is of a very simple structure, being composed of a bag, and of an aperture leading to that bag, into which the food is received. But, in man, it is much more complex in its structure and form, and is expanded in one place, so as to constitute a Stomach. The term *Gullet* is applied to the canal, by which the food passes into the Stomach, and *Intestine* to the canal, through which the food passes out of the Stomach. The length, diameter, and structure of the coats of the Alimentary Canal, and the manner in which the different parts of that canal communicate with one another, which is more or less favourable to the exit or detention of the food, are by no means the same in different animals, and bear a relation to the kind of food. Thus, the Alimentary Canal of an animal that lives purely on grass, is not only much longer, and more complicated in its structure, but also more capacious than that of a carnivorous animal, whose food contains more nourishment in smaller compass, and is more readily digested.

The Intestinal Canal of a man who has arrived at maturity, is between 30 and 36 feet long, and of a medium length between that of an animal destined to live solely on vegetable or animal food, and clearly proves that man is destined by his Creator to be omnivorous.

The Alimentary Mass is carried through the Alimentary Canal by a series of very powerful Muscular Fibres, which constitute a part of its Parietes, and this Muscular coat performs its office so accurately, as to push on the contents of the Intestines contrary to their gravity, and even to push forwards air or quicksilver.

The Alimentary Mass, during its long route through the Stomach and Intestines, is much altered, some of its parts are intimately incorporated, some are dissolved, and others enter into new combinations; and from the great length of the canal, sufficient

space and sufficient time are given for the extraction and absorption of the essence of the food, called *Chyle*, by the Lacteal vessels, which take their rise from the inner surface of the Intestines ; and also for the addition of mucus, which defends the Intestines from the acrimony of their contents, and at the same time facilitates the progress of these.

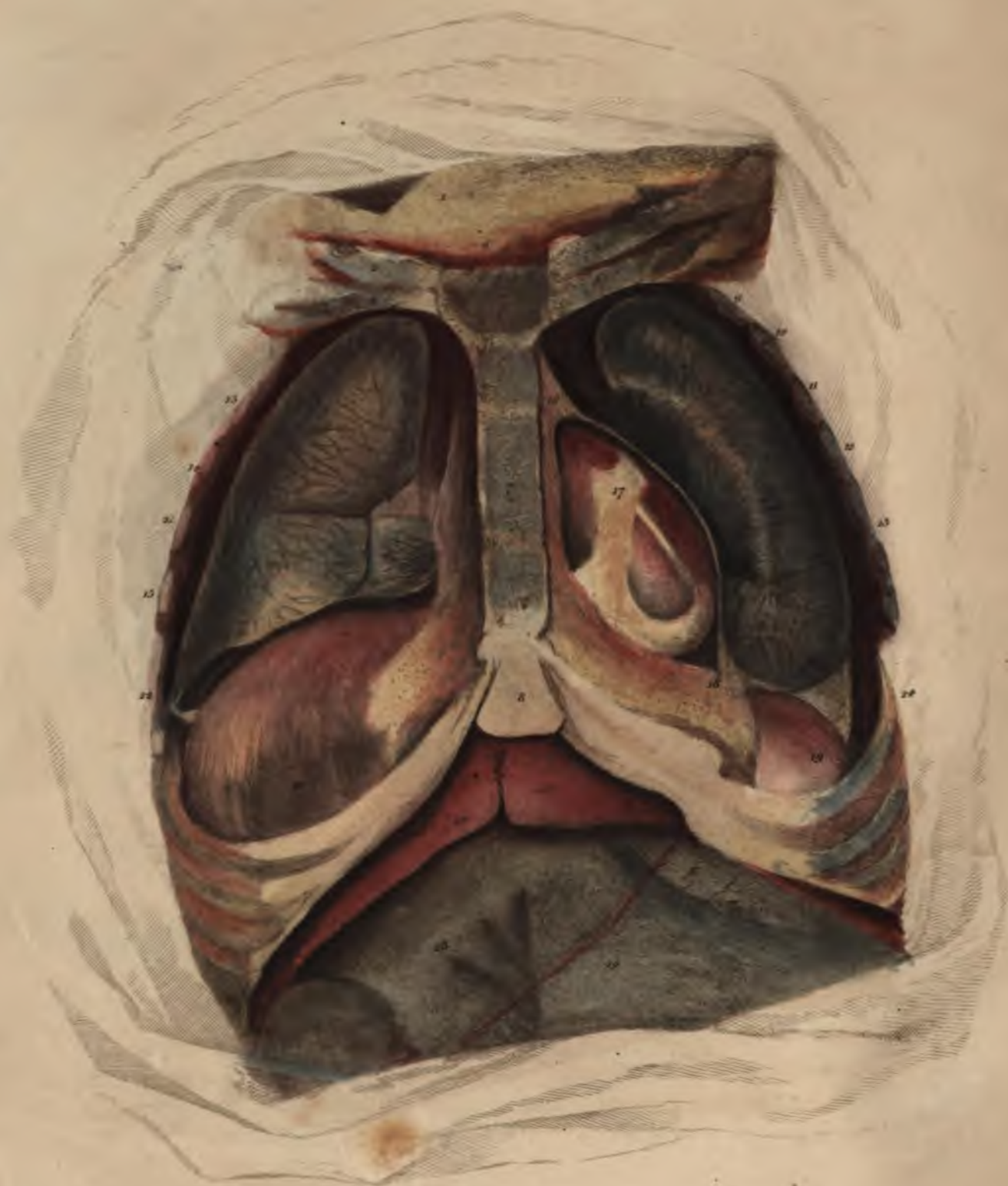
In the subject from which this Engraving was taken, the OMENTUM MAJUS was so thin as to be almost transparent, so that the convolution of the Intestines could be traced through it. It was about the common length.

The position of the LIVER is also well seen in this figure, and its colour, as it appears immediately after death, has been most faithfully represented. Instead of being of the colour of mahogany, (as has been represented by authors) it is of a rich pink colour, as in the coloured Engraving.

The FALCIFORM LIGAMENT of the LIVER is well seen, and the Peritonæum passing from the Parietes of the Abdomen to form that Ligament.



PLATE IV.



Dissect. Anatom. et I. Gibson ad naturam pinct.

E. Mitchell sculp.

Published by Tho. Byles & Co. Edin. 1823.

EXPLANATION

OF

PLATE IV.

IN this Engraving, the contents of the **THORAX** have been exposed by removing a Portion of the Ribs, and leaving the Breast Bone, in order to give a view not only of the situation of the Bowels of the Chest, in respect to the Ribs and Breast Bone, but also of the manner in which the Heart and Lungs are connected to each other by the **PLEURAE**.

1. A Portion of the **NECK**.
2. and 3. The **CLAVICLES**.
4. and 5. The First **RIBS** of the Right and Left Sides of the **THORAX**.
6. The uppermost piece of the **BREAST BONE**.
7. The middle piece of the **BREAST BONE**.
8. The third piece of the Breast Bone, called **CARTILAGO MUCRONATA**;
the figure and length of which vary in different individuals.
9. 10. 11. 12. 13. 14. Point out the cut Portions of the **RIBS**, and below these the Ribs, called **FALSE**, connected by the medium of their Cartilages to the Breast Bone.

The hollow pits in the Breast Bone for receiving the ribs, are imperfectly seen in this figure.

A partial view is also given of the **MEDIASTINUM**, marked by figure 16, which is formed by the apposition of the **PLEURAE**, reflected from the Breast Bone.

The **MEDIASTINUM** inclines to the left side, being fixed above to the **Breast Bone**, and to the edge of that Bone and of the **Ribs** on the left side below, and hence the **Right Pleura** is more capacious than the **Left**.

From the **Mediastinum Anterius**, the **Pleura** on the left side is reflected, and forms the **Capsule** of the **Heart**, and from it to the **Lungs**, to which it gives a partial covering, and from the **Lungs** it passes backwards to form a share of the **Posterior Mediastinum**.

On the right side of the body, the **Pleura** passes from the **Anterior Mediastinum** to the **Lungs**, and from these, it passes backwards to form one of the layers of the triangular space, called **POSTERIOR MEDIASTINUM**. The **Lungs** of opposite sides are thus contained in separate sacs, which do not communicate with each other; hence the **Lungs** of opposite sides are independent of each other, and life may be continued though one of the **Lungs** be in a morbid state. Beside, by this structure, the **Lungs** of opposite sides cannot press on each other when we lie on either side.

Fig. 17. Is placed upon the **HEART**, which, with its large **Bloodvessels** and **Capsule**, is lodged between the two **Pleurae**, forming the **ANTERIOR MEDIASTINUM**.

The **Heart** is in part covered by fat, especially towards its apex, even in the leanest persons.

The **PERICARDIUM** is rough externally, and also was covered in this subject by a small quantity of fat. The inner surface of it is besmeared by a serous fluid, which is poured out by invisible orifices, and was found by **Dr. Bostock** to consist chiefly of water, of a small proportion of albumen, mucus, and muriate of soda.

The **Pericardium** was opened to expose the **Heart**, the situation of which has a relation to that of the **Lungs**, as the functions of the **Heart** and **Lungs** have an intimate relation to each other.

The **Human Heart** is placed obliquely, and with its anterior surface opposed to the **Breast Bone**, its basis on the right side of the **Breast Bone**, and its point or apex directed obliquely forwards, and towards the left side; hence upon its point being elevated

during the contraction of the Ventricle, it is raised between the Lobes of the Lungs of the left side of the chest, and strikes the side between the fifth and sixth Ribs.

The Heart is a muscle of a very florid red colour, and composed of a number of small fibres, which follow different directions; some are longitudinal, others oblique, and others follow a spiral direction.

Though the opposite sides of the Human Heart are united to each other by a mass of interwoven Muscular Fibres, called the Septum Cordis, yet there are in reality two different Hearts, united to each other, one of which is subservient to the circulation of blood through the Lungs, and the other to that through the body at large.

The Heart may be compared to a forcing pump, by which the blood is propelled onwards; it tends to restore the momentum which the blood had lost during its circulation.

The Heart is stimulated to contract by means of the blood, and in consequence of the contraction of the Heart, and dilatation of the coats of the Arteries, the Pulse arises. In proof of which, BICHAT found, that, by transfusing blood from a large Artery of a living animal into that of a dead animal, a pulsation was perceptible in the Artery of the dead animal.

Hence the Pulse is much affected by organic diseases of the Heart; and by a Ligature thrown around an Artery, the pulsation beyond the Ligature is stopped, the influence of the Heart being thus intercepted.

It may be noticed, that the contractions of the Heart are not under the dominion of the will in most cases.

The colour of the blood included within the opposite sides of the Heart, is extremely different; that of the Anterior Heart, or anterior side of the Heart, resembles Venous blood; but that of the Posterior Heart has a brilliant red colour; which circumstance has led BICHAT to describe the circulation of dark coloured blood, and the circulation of red blood; the former of which begins in the system of Capillary vessels, from which it flows by the Veins into the anterior side of the Heart, and

then passes into the Pulmonary Artery and its branches, from which the circulation of red blood begins. The blood during its passage through the Lungs, is exposed to the influence of the atmospherical air; and then flows into the branches and trunks of the Pulmonary Veins, and into the Posterior Auricle and Ventricle of the Heart, and from thence through the numerous branches of the Aorta.

18. 19. and 20. Point the muscular partition between the Chest and Belly, called **DIAPHRAGM**, which, in the state of expiration, is convex towards the Chest.

21. Points out the **LUNGS** of the right side considerably collapsed; two of the Lobes are distinctly seen; but, in this contracted state of the Lungs, the third Lobe is not seen, for it has fallen behind the middle Lobe, marked 22.

It is extremely difficult to communicate by a figure, a correct idea of the texture and consistence of the Lungs. When pressed, they communicate to the touch the same sensation as a sponge, owing to the air and blood they contain; and when sound, they float on the surface of water.

The Lungs are not connected to the cavities of the **Pleurae**, excepting by the reflected **Pleurae**.

The Lungs are somewhat conical, with the basis downwards; and in figure correspond with the cavities of the **Pleurae**; they are convex before, behind, and laterally; but below, are concave, and adapted to the form of the **Diaphragm**.

From the annexed Engraving, it is evident, that the Lungs of the opposite **Pleurae**, even though not fully distended, differ in size and form, the Lungs on the right side are larger than those on the left side, though those are longer than those of the right side; from the right Lobe of the Liver pressing upwards the **Diaphragm**, whilst the Heart, which inclines to the left side, diminishes somewhat the breadth of the left Lungs.

The Lungs do not in themselves exert any degree of muscular power, but are passive during respiration, and follow the movements of their **Parietes**.

The mottled colour of the Lungs, shining through the investing membrane, has been faithfully represented in the Engraving; and the smaller Lobes, which are connected to each other by loose Cellular substance, in which there is no fat, are indistinctly seen.

23, Points out the Lungs of the left side, which, in this subject, were divided into three Lobes, whereas we generally meet with only two Lobes.

24. Denotes a part of the third LOBE.

Respiration consists in the alternate reception and expulsion of the air from the Lungs, or of *inspiration* and *expiration*.

During inspiration, the capacity of the Chest is augmented by the elevation of the Ribs, and the descent of the lateral portions of the Diaphragm.

Expiration takes place from the relaxation of the Muscles of Inspiration, the action of the Abdominal Muscles, and the elastic reaction of the Cartilages of the Ribs, which had been twisted during Inspiration.

The Air, which has been breathed, undergoes a remarkable change as to its properties, and the blood which had been of a dark colour, after exposure to the air at the Lungs, assumes a brilliant scarlet colour.

Air that has been breathed contains,

1st, A considerable proportion of Carbonic Acid Gas.

2d, It contains less Oxygene Gas.

3d, The bulk of the inspired air is somewhat diminished.

MR. DUPUYTREN's experiments have led him to the conclusion, that the influence of the Nervous System is essential to the Chemical changes which the blood undergoes during its passage through the Lungs. The above Anatomist observed, that when he had divided the *Par Vagum* or the eighth Pair of Nerves, the blood had a darker colour than natural, and that the subjects of his experiments died sooner or later with symptoms of *Asphyxia*, though the air continued to enter the Lungs; therefore he inferred, that the change which the blood undergoes in the Lungs, is dependent on the Nervous influence, and ceases

to take place upon the communication between the Lungs and Brain being cut off.

MR. BRODIE's experiments*, and also those of Professor DUMAS, afford a conclusion diametrically opposite to those above mentioned; for, according to the former gentleman, the Brain exerts no influence on the Heart and Lungs; as upon inflating the Lungs, respiration and circulation continue to go on for some hours after the head has been removed; and according to the latter observer, the scarlet colour of the blood of an animal, whose *Paria Vaga* have been divided, may be restored by artificially inflating the Lungs.

MR. BRODIE and MR. BLAINVILLE have also remarked, that after the *Par Vagum* was divided, the inspirations became less frequent, and also that less Carbonic Acid Gas was evolved.

But though the Lungs themselves are not under the influence of the Brain, the muscles by which respiration is performed are so.

According to BICHAT, the phenomena of general death take place in the following order:—When it begins in the Brain, the action of the Brain ceases, which is followed by the sudden cessation of sensation and voluntary motion, palsy of the Diaphragm and Intercostal Muscles, a stoppage of the mechanical and chemical phenomena of respiration, the return from the Lungs of blood of a dark colour, the cessation of the contractions of the Heart, and of general circulation.

25. and 26. Point out the DIAPHRAGM, which has been a little elevated by the Liver, with the basis of the Lungs resting upon it, which is concave, and adapted to the convexity of the Diaphragm. On the right side, owing to the greater convexity of the Liver, the Diaphragm ascends higher.

27. Points out a Portion of the left Sac of the STOMACH; and 28. and 29. a part of the Transverse Arch of the COLON.

* Vid. Croonian Lecture, Phil. Trans. 1812.

FINIS.

APPENDIX.

PLATE V.

SINCE the preceding Engravings and Letter Press were finished, the Curators of the Library of this University have obtained, at a great expense, (nearly £100 Sterling,) a copy of CALDANI's very splendid Anatomical Engravings, amongst which, there is a very faithful lateral view of the Bowels, of the Thorax, Abdomen, and Pelvis of the Male.

Conceiving that a copy of the above mentioned Engraving, upon a reduced scale, viz. one half of the original, would form a valuable addition to the preceding Fasciculus, I prevailed upon my Publisher to add it, as also the observations of CALDANI upon the Engravings of the Bowels, of the Thorax, Belly, and Pelvis, of other Authors.

“**LODERUS** solus inter nuperos hanc Ichnographiae Anatomicae partem minimè neglexit; verum praeter quamquod Syntaxim illam non nisi ab anteriore parte conspexit, et posteriori in facie **LUDWIGIUM** secutus compagem hanc ex infante tenello delineavit, accurationem operam Tabulae postulabant, etsi non dubites eas pulchras dicere. De **LUDWIGII** Tabulis, nihil addendum putamus, cum ipse non satis perfectam sectionis administrationem fuisse fateatur*. Qua propter id nobis curae esse de-

* *Icones cavit Thoracis et Abdominis a tergo apertarum. Lipsiae, 1789.*

buit, ne aliorum vitia effugientes in novis edendis Tabulis in nova vitia offenderemus. Et revera postquam posteriorem viscerum apparatus in adulto homine summo labore repetitis sectionibus deteximus, et binis iconibus exprimere curavimus, utilissimum nobis fore videbatur, si Syntaxis ipsa a latere describi posset et demonstrari. Res vero ex voto successit, atque id certius audemus affirmare, quod cura GERARDI SANDIFORTI tabulae* ad manus nostras pervenerint, in quibus lateralem viscerum adspectum exhibuit, non tam eas rudiori scalpello signatas vidimus, quam nullam, quod maximum est, partium in iis proportionem invenimus. Et sane si eadem servata symmetria Sandiforti Tabulas ad veram humani corporis magnitudinem pictorum methodo redigere velis, videbis profecto quantum a pube Os Sacrum distat, quae caeci intestini et vesicae moles sit, quâ podex respondeat, quodnam spatium inter sternum et cor, inter coccygem et anum intersit. Quae omnia ideo dicta fuisse volumus, ut noscas, Lector, nos id tantummodo nobis ipsis proposuisse, ut utilitati tuae studiis nostris prospicereimus; quod si tibi adhuc nonnulla plane perfecta non videntur, vitia illa locorum distantiae siquidem Scalptores Venitiis degunt, aut inscitiae nostrae, non negligentiae tribuere velis aut inconsiderantiae."

In this view the Peritoneum and right Kidney and Omentum Majus were removed, and the Diaphragm has been elevated.

- 1, 1, 1. The SPINE.
- 2, 2. The OS SACRUM.
3. The different pieces of the Os COCCYGIS.
4. The STERNUM, or Breast Bone.

* Gerard. Sandifort. Tab. Anatom. Lugd. Batav. 1801.

1. The first part of the document is a list of names and addresses of the members of the committee.

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